



DEPARTMENT OF THE NAVY

NAVAL AIR SYSTEMS COMMAND
NAVAL AIR SYSTEMS COMMAND HEADQUARTERS
WASHINGTON, DC 20361-0001

IN REPLY REFER TO
NAVAIRINST 4700.21
AIR-4112
2 Nov 88

NAVAIR INSTRUCTION 4700.21

From: Commander, Naval Air Systems Command

Subj: POLICIES FOR MAINTENANCE ENGINEERING

- Ref:
- (a) DoD Directive 4151.16, DoD Equipment Maintenance Program of 23 Aug 84
 - (b) OPNAVINST 4790.2D, Naval Aviation Maintenance Program
 - (c) NAVAIRINST 5420.35A, Establishment of Product Support Workload Management for Naval Aviation Depots and Technical Field Activities
 - (d) OPNAVINST 4700.24, Policies Governing Maintenance Engineering within the Department of Defense
 - (e) OPNAVINST 8600.2, The Naval Airborne Weapons Maintenance Program
 - (f) NAVAIRINST 5400.14C, The Cognizant Field Activity Program
 - (g) NAVAIRINST 5400.15F, Master List of Engineering Cognizance Assignments
 - (h) MIL-STD-2173, Reliability-Centered Maintenance Requirements for Naval Aircraft, Weapon Systems and Support Equipment
 - (i) NAVAIR 00-25-403, Guidelines for the Naval Aviation Age Exploration Program

Encl: (1) Maintenance Technology Lead Field Activities

1. Purpose. To establish policy and responsibilities within the Naval Air Systems Command (NAVAIR) to accomplish Maintenance Engineering (ME) functions.

2. Scope. This instruction is applicable to and implemented by all activities having responsibility for ME functions for Navy weapon systems, subsystems, airborne weapons, equipment (including training systems), and support equipment. Implementation of this ME policy instruction and detailed procedures for application of ME during weapon system acquisition will be included in the Life Cycle Logistic System Hardware Process Specification.

3. Definitions. Maintenance and ME terminology used in this instruction can be found in references (a) and (b). Product support definitions can be found in reference (c).

4. Information

a. Reference (d) issued policies applicable to all Department of Defense (DoD) activities and prescribed the

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responsibilities to be carried out by the ME activity within each DoD component. Reference (e) defined ME policy for Navy equipment, weapons and weapon systems and directed that ME be established and recognized as one of the principal activities within the maintenance structure of the Navy. Reference (f) established specific ME policy for airborne weapons.

b. ME plays a significant role in establishing and controlling the requirements for maintenance resources. ME commences at program initiation and is a discrete and highly visible part of weapon system development, acquisition and support, specifically designing for maintainability and maintenance planning.

c. Through all phases of the life cycle, ME functions and responsibilities encompass maintenance analysis and planning, maintenance studies, concepts and plans, and equipment/maintenance performance data to be used during the design and development of weapon systems, subsystems, airborne weapons and support equipment and their logistic support systems. ME employs systems engineering processes and analytic tools, namely Logistic Support Analysis (LSA) and Reliability Centered Maintenance (RCM) analysis; to determine maintenance requirements.

d. During the concept exploration through full-scale development phases, the maintenance engineer will participate in technical requirements development and design reviews to ensure an effective and economic maintenance program. As the weapon system/equipment progresses into the production and operational phases, ME will focus on evaluation and analysis of performance and maintenance data. The ME activity will monitor and ensure effective and efficient use of maintenance resources, provide resolutions to in-service maintenance problems, develop recommendations for design or process changes/modifications, and utilize emerging maintenance technologies to improve/enhance maintenance capability. During each life cycle phase, ME activity should be monitored closely to ensure the performance of maintenance engineering analyses provide effective results in terms of fleet maintenance improvements.

e. ME will be transitioned from Naval Air Systems Headquarters (NAVAIRHQ) to the ME cognizant field activity (CFA) following the policy and procedures of references (f) and (g), and as specified in any and all cognizant agreements. The transition of ME will be coordinated with transition of logistics management (LM) and design engineering responsibilities; ME transition will occur as early as deemed practical and feasible by NAVAIRHQ Logistics and Maintenance Policy Division (AIR-411) ME's, assistant program managers, logistics (APML's) and program manager (PM's).

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5. Policy. ME shall be fully implemented during concept formulation, design, development and in-service product support efforts for aircraft weapon systems, subsystems, airborne weapons, equipment and support equipment. Deviation to comply with or recommended changes to this instruction will be addressed to NAVAIRHQ AIR-411.

6. Responsibilities

a. Product Support Management Office (AIR-41P) will:

(1) Review and ensure proper emphasis/priority is applied to identification of ME workload requirements during product support planning at all NAVAIR field activities.

(2) Approve transition of ME responsibilities to the Naval Aviation Depot (NAVAVNDEPOT) Product Support Directorates (PSD's) and technical field activity Product Support Advocates (PSA's).

(3) Approve selective transfer of maintenance technologies to the responsible field activity. A field activity that has demonstrated leadership and developed subject matter expertise in a particular technology area will be designated the "lead field activity" for that technology. They will provide NAVAIRHQ and NAVAIR field activities with information on improvements and other technical developments for potential use by the maintenance community. Enclosure (1) identifies the lead field activity for each technology area.

(4) Program and budget for the resources to establish and sustain ME as an element of product support.

b. Logistics Management Division (AIR-410), Support Equipment Logistics Management Division (AIR-417), and Airborne Weapons Logistics Division (AIR-418) APML's and LM's will:

(1) Approve and publish the maintenance concept that will best achieve maintenance and operational requirements for assigned hardware.

(2) Approve and publish the maintenance plan for assigned hardware programs.

(3) Program and budget for the resources required to perform ME on assigned hardware.

(4) During integrated logistics support (ILS) planning for each new program, include a Maintenance Engineer from AIR-411 or NAVAVNDEPOT PSD with the responsibilities for

(a) providing ME expertise during maintenance concept and plan development;

(b) identifying data elements required to perform ME and reviewing contractual documentation to ensure inclusion of these data elements; and

(c) reviewing and analyzing program LSA's, failure modes and effects analyses (FMEA's) and RCM and Corrective Maintenance Analyses and other applicable maintenance-related analyses.

(5) Ensure all Engineering Change Proposal ILS impacts have been thoroughly reviewed, especially impacts to maintenance requirements and maintainability features/characteristics.

(6) Initiate transition of ME to the CFA following the requirements of reference (g).

(7) Participate with the AIR-411 maintenance engineer and provide recommendations to the Product Integrity Management Division (AIR-516) during the review/conduct of maintainability trade-offs to ensure life cycle cost considerations are given proper emphasis.

c. Maintenance Engineer (AIR-411) will:

(1) Provide overall ME management through policy, guidance and implementation procedures; monitor performance of all ME functions to ensure effective implementation of ME practices.

(2) Assist the APML in developing and defining the preliminary maintenance concept and provide technical assistance/consultation during hardware design and development.

(3) Apply ME expertise and naval aviation lessons learned to develop and review maintenance design criteria for inclusion in development plans and proposed technical approaches.

(4) Evaluate the maintainability/maintenance portions of contractor proposals as an element in source selections.

(5) Incorporate selective new or emerging technology into maintenance techniques, processes and procedures.

(6) Participate in government-contractor design reviews, inspections and mock-ups in order to influence and recommend hardware and software design improvements to NAVAIRHQ AIR-516 for enhanced maintenance capability.

(7) Validate contractors selection of maintenance test items, sequence and data collection and recording methods.

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(8) Review and provide concurrence/comments on contractor recommended changes to the reliability and maintainability specifications.

(9) Witness, review and evaluate maintainability demonstrations for maintenance impact and recommend design improvements to NAVAIRHQ AIR-516 reliability and maintainability engineer.

(10) Review technical reports from system/equipment technical and operational evaluations and identify the cognizant engineering and logistics impacts on maintenance and recommended design improvements.

(11) Review operational feedback data to support maintainability performance requirements for use in specifications for new, upgraded or modified equipment.

(12) Provide direction on the storage and maintenance of all logistic and maintenance analyses via the Naval Aviation Logistic Data Analysis (NALDA) system.

(13) Provide endorsement to the design prior to final approval at Critical Design Review.

(14) Review and comment on the following contractor analyses:

- (a) LSA.
- (b) FMEA.
- (c) RCM analysis.
- (d) Corrective Maintenance Analysis.

(15) Review and conduct annual assessment of each field activity's ME and maintenance technology program to assist NAVAIRHQ AIR-41P in the performance evaluation of each product support activity.

(16) Coordinate with the APML/LM in the development of milestones for transition of ME to the CFA (NAVAVNDEPOT PSD or PSA) and provide detailed schedule for transition of responsibilities.

d. Assistant Commander for Systems and Engineering (AIR-05) will:

(1) Provide authoritative technical direction on all design engineering matters, including design criteria, analysis and testing, material and manufacturing processes, quality controls and structural life management.

(2) Ensure that systems and equipments are designed and procured for ease of maintenance;

(a) Include requirements for maintainability in systems and equipment specifications, procurement requests (PR's) requests for proposals (RFP's), and requests for quotations (RFQ's).

(b) Specify design, mock-up, tests and demonstration requirements for maintainability consistent with the stated operational requirements and any established maintenance plans.

(c) Effect firm and enforceable contract requirements for reliability, durability, material selection, manufacturing quality, and related items that affect the overall frequency, resources and costs of maintenance.

(d) In conjunction with the Assistant Commander for Fleet Support and Field Activity Management (AIR-04), ensure effective, interactive and complementary systems design and LSA efforts.

(3) Maintain effective structural life management and configuration control of systems and equipments, consistent with overall service life and maintenance plans.

e. Naval Aviation Maintenance Office (NAVAVNMAINTOFF) will:

(1) Provide administrative management of select maintenance technologies upon transition from NAVAIRHQ;

(2) Provide ME technical and analytical support to NAVAIRHQ, NAVAVNDEPOT PSD's, field activity PSA's, and fleet activities.

f. NAVAVNDEPOT PSD's and NAVAIR field activities PSA's will:

(1) Establish ME as a principle activity for in-service weapon systems, subsystems, weapons, equipment and support equipment maintainability and maintenance.

(2) Establish active liaison with fleet activities and all aviation technical communities on in-service technical maintenance problems.

(3) Provide engineering support and consultation services to all fleet activities, including participation in system safety reviews and accident investigations.

(4) Provide ME technical support to NAVAIRHQ, other PSD's and PSA's, and the Fleet.

(5) Review and perform, as applicable, LSA, FMEA, RCM analysis, corrective maintenance analysis and Level of Repair

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Analysis (LORA) to support proposed design changes and modifications and ensure update of all maintenance and logistic data bases for cognizant assignments;

(6) Review and ensure action is taken on quality deficiency reports, hazardous material reports, technical publication deficiency reports and other fleet trouble reports.

(7) Ensure engineering investigations are performed when necessary and review results to identify any requirements for design changes or changes to maintenance procedures.


(8) Organize Age Exploration (AE) programs per references (h) and (i) to spotlight trouble equipment and subsystems and implement AE data collection and analysis procedures which will ensure identification, correction and/or adjustment to maintenance requirements and methods.

(9) Develop and prescribe inspection procedures and criteria for maintenance and repair of in-service products.

(10) Review mission/tactical, support equipment and Automatic Data Processing software design, operations and related support documentation to ensure maintainability features are present.

(11) Evaluate and recommend criteria governing the reclamation, condemnation and demilitarization of weapon systems, weapons, equipment and support equipment, in compliance with NAVAIR policy.

(12) Submit a semiannual review to NAVAIRHQ (AIR-41P and AIR-411) of all accomplishments from the application of ME in support of products and/or new opportunities for application of technologies to improve maintenance.



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Acting

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MAINTENANCE TECHNOLOGY LEAD FIELD ACTIVITIES

In order to recognize established expertise and minimize redundancies of effort in fleet and product support for the following maintenance engineering and technology processes and applications, a lead field activity has been designated. This activity is the responsible authority for coordinating among all activities, any advances or improvements in the application of these technologies as a maintenance engineering function.

<u>Activity</u>	<u>Area of Technology</u>
NAVAVNDEPOT Alameda	Aircraft Wiring Systems Air Refueling Stores ASW Systems Auxiliary Power Units Corrosion Prevention and Control External Fuel Tanks Fuel Cell Repair Heat Treating Hose and Tubing Magnetic Tape Recorders Propeller Blades Structural Repair, General
NAVAVNDEPOT Cherry Point	Acoustical Analysis Aircraft Carrier Landing Systems (ACLS) C-scan Composite Repair Computer-Aided Acquisition Logistics System (CALS) Composites, Sine-Wave Structure CAD/CAM in Aircraft Maintenance Engine Blade/Vane Repair Instrumental Analysis Laser Processing Polymers, Thermoplastic Potting Compounds/Sealants
NAVAVNDEPOT Jacksonville	Aerospace Metals Aircraft Interiors Borescopes Chemical Analysis Electro-Optics Environmental Chemistry Hazardous Material Control Insulation Material Lubricants Material Wear Plugs and Power Cables

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<u>Activity</u>	<u>Area of Technology</u>
NAVAVNDEPOT Jacksonville (con.)	Printed Circuit Board (mfg) Surface Treatment Thermal Spray Powders Ultrasonic Image Enhancement
NAVAVNDEPOT Norfolk	Abrasives Adhesives Anticing Compounds Coatings, Fluidized Bed Pneumatic Seals Polymers, Thermosetting Solvents Surface Analysis Thermal analysis Wheels
NAVAVNDEPOT North Island	Aircraft Tires Bearing Refurbishment Composites, Honeycomb/Sandwich Structure Crash Recorders Fire Fighting Systems Fixed Wing Vibration Analysis Heat Damage Evaluation Hydraulic Components Preservation Sensor Systems Transparencies Welding
NAVAVNDEPOT Pensacola	Cleaning Compounds Elastomers Electrostatic Discharge Fasteners Fractography Helicopter Blades Helicopter Dynamics/Aerodynamics Paint/Stripping Systems/Processes Scanning Electron Microscopy
Naval Training Systems Center	Maintenance Simulation and Training Technology